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ABSTRACT

This guide was developed to assist adult education program directors and staff to integrate technology into their programs. Adapted from the original guidebook developed by the Merrimack Education Center's Adult Education Computer Applications Project, it focuses on major considerations in matching computer applications with instructional program goals. The guide is organized according to the four major steps in the process: (1) preliminary planning activities; (2) planning computer applications with an emphasis on selecting software for the instructional process; (3) hardware (equipment) considerations; and (4) planning for implementation. Appendixes to the guide contain a list of resources, a list of software especially useful for adult education applications, a software evaluation form, a software review guide order blank, and a bibliography. The guidebook can be used as a stand-alone manual or as part of a staff development program. (KC)

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COMPUTERS IN ADULT EDUCATION: A PLANNING GUIDEBOOK

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FOREWORD

The Merrimack Education Center, in cooperation with the Massachusetts Department of Education Bureau of Student, Community and Adult Services, has developed this preliminary Guidebook as a service to adult educators in the application of computers in their operating programs.

The Computer Applications Planning document identifies essential planning activities and describes some steps to follow in developing and implementing technology at a local site. This guide is organized according to the four major steps in the process: (1) preliminary planning activities; (2) planning computer applications with an emphasis on selecting software for the instructional process; (3) hardware (equipment) considerations; and, (4) the important step of planning for implementation. This Guidebook can be used as a stand-alone manual or as part of a staff development program. The guide also serves as a principal resource for MEC's Computer Applications Planning Seminars, which are provided to adult education staff who may be interested in the development of three-year plans for their computer programs.

Since 1983, the Merrimack Education Center in Chelmsford, Massachusetts has worked closely with the Massachusetts Department of Education, Division of Student, Community, and Adult Services, in a joint project to support and improve adult basic education through the infusion of computer applications into on-going programs. This task consisted of a series of carefully coordinated actions involving many adult education projects statewide. Some steps in this process were the identification of available resources, the development of software evaluation criteria, hardware and software acquisition, establishment of staff training programs, exploration of strategies for using computers with adult learners, and the dissemination of effective models. At this writing, this task is on-going. Areas of investigation currently include the implementation of other technologies (videotape, cable TV, videodisc) and also the use of computers in the teaching of writing skills to adults.

Concurrent with the Merrimack Education Center's efforts in assisting adult educators, MEC has been a leading support organization for working with school districts in technology applications planning. Through its Computer Applications Planning Seminars (CAPS), MEC has assisted more than one hundred school districts across the country in the development of a long-range plan for technology integration. An important element of the seminar series is a guidebook that serves as an organizer for assisting key people in a school district in the planning process. The guidebook, Computer Applications Planning, has been adopted by several states, including California and Georgia, as a model for establishing a planning process.

Based on MEC's experience in both adult education and computer applications planning, Computers in Adult Education: A Planning Guidebook was developed to assist adult education program directors and staff to systematically integrate technology into their programs. Adapted from the original guidebook, it focuses on major considerations in matching computer applications with instructional program goals. The step-by-step approach described in the guidebook should help adult educators avoid false starts and typical mistakes during the planning and implementation process. Information on this publication and training seminars can be obtained by writing.

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ACKNOWLEDGMENTS

The idea for the Guide came from adult educators who in the past two years have been attending a series of Computer Applications Seminars at the Merrimack Education Center (MEC). Essentially, adult education programs with limited resources have been initiating computer programs at their respective sites, such as computer literacy and the selection and utilization of software applicable to the teaching of the adult basic education skills. We have borrowed and extended some of the material from the Computer Applications Planning publication developed earlier by MEC and currently being used on the national level for programs at the elementary and secondary school levels.

This Guide was written by George Hanify and Robert Milley. Merrimack Education staff members Richard Lavin, Jean Sanders and John Phillipo have also made contributions to this publication. We also wish to thank Gale Ewer from the Bureau of Student, Community and Adult Services for her encouragement in the development of this publication and her continuing interest in the application of technology for the adult learner. We wish also to acknowledge the contribution of adult education software specialists who have attended many seminars on the topic and specifically to Linda Braun, Pauline Kightlinger and Kenneth Tamarkin for their assistance in the preparation of this document.

COMPUTERS IN ADULT EDUCATION:
A PLANNING GUIDE

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CHAPTER I: PRELIMINARY PLANNING ACTIVITIES

Introduction

> "In 1982 a cascade of computers bleeped and blipped their way into the American office, the American school, and the American home. There are occasions ....when the most significant force in a year's news is not a single individual, but a PROCESS, and a widespread recognition that this process is changing the course of all other processes."
>
> Time Magazine, January 1983,
> The Computer named "Man of the Year"

The computer revolution has occurred - education is feeling the ripple effects. The low cost microcomputer has made powerful computing systems available in great numbers to businesses and homes, and now to schools and learning centers. Computer systems are being purchased by educational institutions with even the most limited budgets.

As educators, we have had an unprecidented experience over the past few years. For the first time we have been placed in the position of having to select and purchase computer systems. Few, if any, of us have had more than a limited experience in using a computer. Formal training through the university level until recently has provided woefully little first hand experience with a computer system as a whole. Some of us as graduate students may have logged on/off a terminal, entered data into a canned statistical program, and received a printout. With microcomputers, the entire system sits right in front of you on the desk. The user becomes the system manager, responsible for operating systems, software and hardware peripherals. Thus, microcomputers require a holistic knowledge of computers, and, in many instances, have brought with them a plethora of problems and difficult decisions.

Perhaps the most difficult part of implementing computers in schools today is deciding exactly why and for what purpose the computer is needed in the first place. Most of us suspect that there is a great potential for computers to impact education, particularly adult education programs. For an entire generation of adults whose formal education did not include exposure to computers, adult educators need to provide a wide range of experiences to help students understand what these machines are, and what they can do, and to enable them to work effectively with a computer when necessary. Furthermore, we should recognize that the application of computers to instruction offers adult learners maximum payoff in terms of acquiring real job skills.

This guidebook was written to help you to plan and to implement instructional computer applications. It is a guide for adult educators who want to get started; to learn about potential applications, to become aware of the hazards during early implementation, and to benefit from the experiences of those who have solved common problems and made some right choices when making difficult decisions.

We maintain that planning for the implementation of computers in adult education requires a unique approach to the planning process. The challenge is not only to develop applications for today, but to establish priorities based upon what we know today, and to put into action a process that will guide us into the future. The guidebook provides you with a logical sequence of steps which will help you to match the needs of your programs with the technology available today. We provide you with practical suggestions for each phase of the planning process. The preliminary planning activities described in this chapter will help you to identify and organize the resources required for the curriculum applications planning activities in later chapters.

Form Your Own Vision

You need to start thinking about just how you might use computers. You need to picture how you want computers to be integrated into your instructional programs. While this picture may not be clear initially, you can probably focus on a few snapshots which will eventually be part of a larger total picture. This larger picture - let's call it your vision - should contain not only the element of computer technology, but should clearly demonstrate the relationship between the new technology and specific program objectives to which it is applied. You need a vision, based upon good content, which always endures, and upon good methods, which continue to engage learners and teachers and are effective.

Here are three snapshots of actual situations in which adults have had the opportunity to apply computers in their learning experiences.

> Jim is a 40 year old male who dropped out of high school in the ninth grade. He remembers experiencing a great deal of failure and humiliation because of low reading skills and recalls being a victim of much taunting. However, he has very good manual skills. He is presently working as a machinist but also has skills in carpentry, electricity and plumbing. He feels that he is held back through his difficulty in reading directions and plans.
>
> Jim's instructor at the Adult Learning Center, Nancy, recounts how in 1980 he had a serious operation, after which he was paralyzed for several months. Although doctors felt he would recover only partially, he has regained all of his physical strength and abilities except for peripheral vision. He enrolled at the Adult Learning Center in September of 1981 and tested at approximately a 5th grade reading level at that time. His confidence level was quite low and he would not ask for help or participate in class.
>
> Reviewing his folder, Nancy indicates that Jim is now reading at an 8th grade level. He worked with a counselor on some personal issues that affected his self-image as a learner. He has become more confident and more often speaks up in class and with the teachers outside of class. Spelling is an art still requiring improvement.

In November Jim started using the computer to supplement his instructional program. He completed a keyboard tutorial, Mastertype in November, then started Context Clues, a reading drill program, and advanced from Level A to Level F in less than two months. In addition tohis class work and directed study, he is currently using the computer to work on his spelling skills and uses the Spell It! program which he started last year.

We had a chance to ask Jim some questions about his use of the computer.

What was your initial reaction to working on a computer?

I found it to be very interesting. My sister and her husband are into computers - to them it's a toy! I thought it was kind of foolish when I heard about the computer classes. I didn't know what to expect and I wanted to find out more about them. It's a challenge. First program I did was the keyboard.

How do you feel about using computers as part of your instructional program?

I find it to be a lot of help. I can refer back to it over and over again until I understand it. I've used spelling programs and GED vocabulary. I can go at my own pace rather than someone else's.

How do you think using the computer is different from other ways of learning at the Center?

The computer tells me immediately when I'm wrong. A book doesn't. It also tells me when I'm right. I know it right away.

What do you like best about using computers for learning?

They are easier to learn from because you can set your own pace.

What do you like least?

The typing because I don't know how to type. I find it difficult locating some keys.

Would you recommend using the computer for other students?

Yes. Easier than reading a book. You can look at the pictures on the screen which can help you. In a book it's all words. The computer helps you find the answer.

Any other remarks about how the computer has contributed to your learning or about how you see yourself as a learner?

> I would take a class where I can use the computer again. Even the same one just to learn more.

At another adult learning center we have this account where computers support a different application.

> Joan is a sixty-year old widowed woman with grown children. She was fascinated by computers, but considered herself too old to learn to use them. Yet, her interest overcame her fears and she enrolled in a word processing training program.
>
> For the first few weeks of the program she struggled. She felt that nothing was getting through, that all was a jumble. She was able to correctly follow instructions, but she felt that she did not understand why and how things occurred on the screen. When confronted with some unexpected results on the screen, she became very upset, gathered her things, and prepared to leave the class, and the new world of computers, forever.
>
> Her instructor, who had been trying to encourage and reassure her, tells us how she sat with her for twenty minutes listening to Joan express her despair. The teacher told her how she felt that it was crucial for her to remain in the class and have a positive experience. Her advice was straightforward: "Hang in there no matter how little sense it makes to you. Do the exercises, even if they seem isolated and unrelated to one another. Have faith in yourself, and the clouds will break and the sun will shine through".
>
> It took over a month, but one day the sun did shine through. Joan successfully completed the course and now has an excellent job doing word processing.

Finally, here is another situation in which a very special group of adult learners have had a unique learning experience, made possible to a great extent by the use of computers.

> Suzanne is the instructor of a special class, whose students are mildly retarded adults. For two years the students had regarded the computer room as a special

magical place that they would never be allowed to enter. Suzanne approached David, the computer instructor, with a proposal to have an experimentalclass for her students. David was agreeable, and suggested they use word processing as part of the students' writing class. They would start by having each student write his/her name, address and telephone number.

When the students were told by Suzanne that they were going to use the computers, they were very excited and enthusiastic. Finally the day of the great event arrived. With mouths open in awe, the students timidly entered the holy of holies, the computer room. David had prepared the machines for them; the word processing program had been loaded, and a document opened, waiting for the students to begin typing. The students were seated at their machines and the lesson explained to them. With tremendous effort and concentration, the students began their task.

Suzanne and David went from student to student, answering questions and assisting when necessary. Debbie, a student, beamed proudly at her work. She needed to make a few corrections, and had done so with David's help. But unlike her regular papers, disfigured by unsightly and humilating erasures, the screen displayed a perfect finished product. To complete the lesson, Debbie and the others printed out their work.

David questioned Suzanne on the similarities and differences between her regular class and this computer assisted lesson. She felt that her role as the teacher was almost unchanged. She still helped the students in the same manner that she did when they did their work with pencil and paper. The great difference was the reaction of the students. Never had she seen them work this hard for such a long length of time. Never had their work seemed so important to them. And never had they been so proud of their finished work.

Each of these situations demonstrates a very different approach to using computers with adult learners. Note, however, that each application essentially involves learners with different, but real needs. Instructors, attempting to meet those needs along with other strategies and resources, decided to use the computer because they felt it was an appropriate tool. Forming your vision of how computers may help adult learners really involves your making judgments about the appropriateness of the tool for helping you achieve your own program goals.

Organize a Planning Group

One of the tenets of most planners is that innovation is a people process; planning for change requires that those who are to be impacted by it be involved in the planning stages. At your center those directing the planning effort need to ensure the involvement of administrative staff, teachers and students. The number of persons involved in a planning group will be a function of a wide range of factors: size of the staff, number of different programs (i.e. ABE, GED, ESL, job skills, etc.), learner populations served, sources of funding, and organizational structure within the community. Here are some general guidelines:

- the number of people involved should match the amount of work to be done
- include some skeptics or resistors, or make provisions for their input to the planning process
- include those with technological expertise, but avoid having a group exclusively of experts
- in larger centers, make sure that major program staffs are represented
- provide adequate planning time during an agreeable time of day

Conduct Staff Awareness Activities

The purpose of conducting awareness activities is to ensure that important groups within the institution have the information they need to participate in the planning process. It is important to adjust the content and format of all awareness activities to the needs of the group. The focus of these activities should be on developing awareness and general understanding of computers and the issues related to implementing computers in instructional programs.

Here are some suggested topics that might be covered:

Instructional Software for Adult Learners

Demonstrations of a variety of applications possible within different subjects with easily accessible software. Discussion of potential benefits and limitations associated with each application.

Educational Applications of Computers

Demonstrations of computer applications in instruction, instructional management, and program administration. Discussion of hardware, software and implementation requirements.

Functional Components of Computer

Introduction to microcomputers and how they operate. Emphasis on practical aspects of system operation, procurement, and maintenance.

Some other considerations for designing awareness activities are:

1. Awareness activities should provide the opportunity for non-experts to participate and share in the development of "a vision" of how computers will be introduced.

2. When the natural intimidations of technology are coupled with general resistance to change, success becomes more of a challenge. Awareness sessions should provide an opportunity for concerns to surface, and for unjustified fears to be allayed.

3. Consider a variety of ways to provide awareness activities.

    - seminars conducted by consultants on-site or at regional computer centers
    - seminars conducted on-site by your own staff
    - self-study activities, including selected readings and/or video taped presentations
    - attendance at workshops sponsored by vendors
    - attendance at workshops and presentations at regional conferences and conventions
    - site visits to model programs at nearby adult education centers

Identify Planning Resources

While people are critical to the success of the planning effort, their effectiveness is determined in part by the quantity and quality of resources they have available to them. Typically, these resources fall into five categories:

1. Information

   What are other learning centers doing: Are there exemplary programs or materials available for review? What does the research say? What resources are available at near by colleges, regional computer centers and educational computer user groups? What computer skills do current staff members have?

2. Experience of Current Staff

   What computer skills do current staff members have? Are they able to share with others what they know?

3. Materials

   What journals, reports, and special publications are available? (A list of materials resources in Appendix A might be helpful.) Where can staff members see various hardware and software?

4. Planning Time

   How much time is required for meeting and work sessions? How and when is this time going to be provided?

5. External Consultants

   What specialized skills and knowledge may be acquired from external sources? From what sources? For how long? At what cost?

Persons undertaking the task of planning and implementing computers should recognize the need for procuring resources at appropriate stages. At this point, before moving on to Chapter II, you should prepare a preliminary list of resource requirements and how they will be met.

CHAPTER II: PLANNING COMPUTER APPLICATIONS

The primary assumption on which this guidebook is based is that decisions concerning the application of computer technology in adult education should be made in light of adult learning program needs. Thus, rather than being technology driven, planning activities should be directed towards matching the needs of adult learners, instructors, and administrative staff with appropriate technology applications. The chart below shows the sequence of the planning activities.

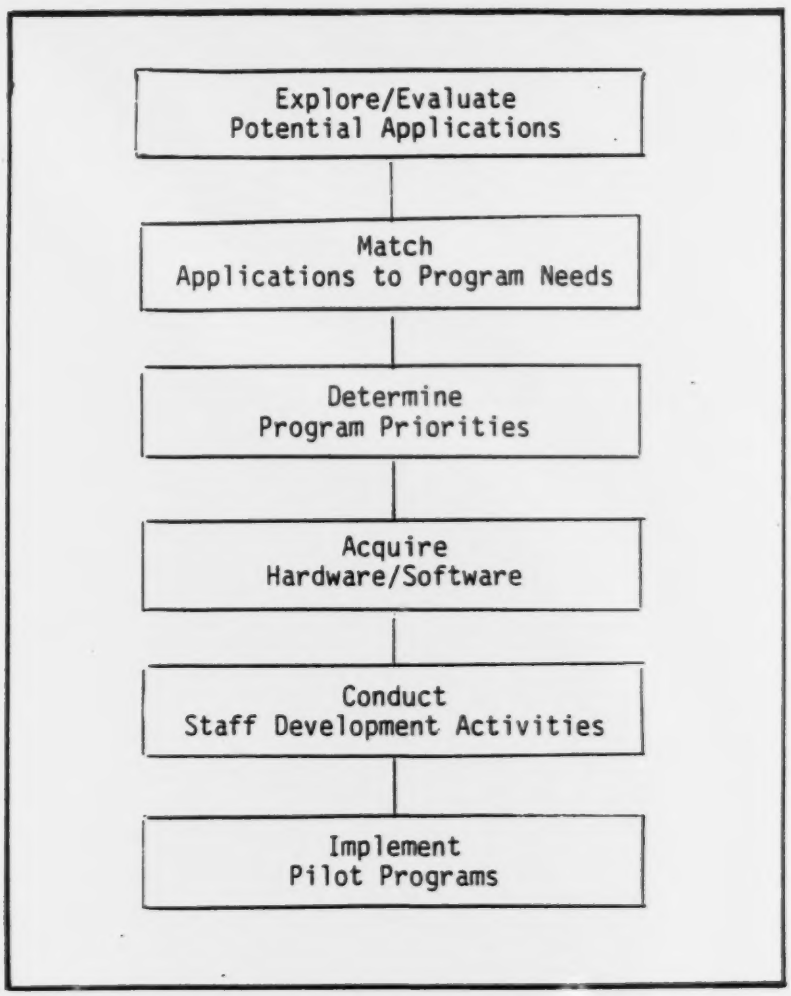

Figure 1

Match Applications to Program Needs

Most adult educators concur that a major goal of adult education programs is to create a learning environment which is supportive of the needs of adult learners. Malcolm Knowles identifies some of the characteristics of this environment as "superior conditions of learning", that is "conditions which are more conducive to growth and development than others":

- learners feel a need to learn
- learners perceive the goals of a learning experience to be their goals
- the learning process is related to and makes use of the experience of the learners
- learners participate actively in the learning process
- learners accept a share of the responsibility for planning and operating a learning experience, and therefore have a commitment toward it
- learners have a sense of progress towards their goals

The learning environment is also characterized by

- physical comfort
- mutual trust and respect
- freedom of expression
- acceptance of differences *

As you expand your vision of how computers might permit the needs of your program to be addressed, you will begin to develop an understanding of the specific computer capabilities which are most promising for the

* From Andragony in Action, Malcolm Knowles, 1984.

adult learning environment. Some positive aspects of computer applications shared by practitioners and researchers are given below:

1. The branching capability of computers permits instruction to be individualized to the learner needs.

2. Computer software can create interactive learning environments in which the learner is actively involved.

3. Computer-based drills and tutorials may be learner-controlled and learner-paced.

4. Computer-generated drills can provide immediate feedback and systematic reinforcement.

5. Adult learners using computers tend to be more self-directed in their learning by doing their own diagnosis, by choosing lessons, and showing less fear of testing.

6. Adult learners often feel comforted that they can make mistakes privately; that is, the computer is personal and infinitely patient.

7. The computer can provide objective feedback about progress. It does not make judgements on the basis of age, sex, or race.

8. Computers can promote socialization. When two or more learners work together, they often help and support each other.

9. Computer applications in instruction and program management can free instructors to devote more time to coaching, counseling, and other "strictly human" endeavors.

10. Computers for adult learners promote educational equity by providing access to new technology not available during earlier school experience.

There are many applications for the computer that offer promising benefits to learners and instructors in adult education settings. It is particularly important for you to look systematically at what is possible with computers in light of your own specific program. Some of the decisions you have to make will involve weighing the real benefits of each potential application against its cost.

Classify Instructional Applications

In the introduction to The Computer in the School: Tutor, Tool, Tutee, Robert Taylor provides a useful way to start thinking about the wide variety of instructional applications possible with a computer. Taylor proposes a framework that consists of three major categories: Tutor, Tool, and Tutee. Instructional computing applications may be sorted into these categories based upon the relationship, or instructional mode, created between the learner and the computer. In Tutor mode learners interact with the computer by means of instructional software, with the expectation that the computer will assume the role of the teacher, or tutor. In Tool mode, learners take advantage of a general computer capability as a tool by means of generic software, such as calculation or statistical programs, word processing, or data manipulation programs, to enhance their own human problem-solving abilities. In Tutee mode, learners assume the role of a teacher, in the sense that they instruct the computer, to solve relevant problems by means of a computer programming language. Aspects of each type of applications are offered below.

Computer as a Teacher

Within the category of computer as teacher you will find that the quality of applications is dependent upon the instructional design of computer software, often called "courseware". There are five popular instructional strategies employed in the design of this kind of software:

- Demonstration programs convert the computer into a demonstration device to be used by a teacher in ways similar to a chalkboard, overhead projector, or filmstrip/movie projector.
- Drill and practice programs create drill problems on previously taught material, providing appropriate repetition and reinforcement based upon learner responses. In some programs, record keeping and student management capacities are included to facilitate a diagnostic/prescriptive approach to drill.

- Tutorial programs attempt to teach new skills or concepts by creating interactive dialogue between the learner and computer. Often drill and achievement assessment are included.

- Simulation programs create a model in which certain factors may be controlled, allowing the learner to explore and discover interrelationships within the model.

- Game programs provide an interactive environment in which students are challenged to apply knowledge and skills to achieve a relevant goal.

Instructional applications made possible with software employing these instructional strategies are often called CAL, computer-assisted learning, or CAI, computer-assisted instruction. Successful CAL applications require the selection of high quality software, matching appropriate instructional design with high priority learner needs. Important criteria to be considered when selecting CAL software are presented later in this chapter.

Computer as an Instructional Tool

Tool programs have been popular in business, industry, science, and government because they save people time and energy in performing routine tasks. Application software designed to permit computer users to perform specific tasks such as word processing, numerical analysis, and data management has been designed or adapted for learners in the educational environment. Several innovative applications, developed and tested with adult learners, involve applying word processing in the teaching of reading and writing.

Other tool programs have been developed to assist instructors in generating their own curriculum materials, such as individualized worksheets, drills for spelling and sight vocabulary development, even short tutorial lessons. These teacher utility programs can free instructors from the drudgery of many routine tasks.

Computer Programming

Many adults have a desire to learn about programming and may find that they have a natural inclination to learn a programming language. However, it is not essential for a learner to know how to program in order to use a computer. Programming may be taught as an approach to problem solving in which adult learners use their logic and organizational skills to top the computer's capacity for calculating and manipulating data. There are many resources available to assist planners to develop programming applications. In general, no software other than a programmming language is required for these applications. This guidebook focuses on applications in which the computer is used as a teacher and as a tool.

Select Software

Software selection should precede hardware selection because most software is not compatible with all popular computers. Software designed for microcomputers is "brand specific", which means that programs that run on one brand of computer may not be compatible with other brands. Common sense dictates that you determine the need, find the software to fill that need, and let software determine the brand of computer to buy. That may sound simplistic, but for most instructional applications a computer is useless without software. Unless you are a programmer and can develop your own programs, you must determine software requirements before you buy hardware.

First Step: Identification

The first step in software selection is for your planning group develop a list of software that is related to each of the instructional applications anticipated. It is a major task to identify individual programs for each specific application, much less to evaluate them for quality and utility. A list of especially useful software identified by adult educators is given in Appendix A. Here are some ways to get information about useful programs:

- read software resource guides
- read software review in journals and magazines
- visit software preview centers
- review demonstration diskettes
- visit vendor displays at conferences and conventions
- access on-line databases that specialize in software listings and reviews
- talk with someone who is using the software
- talk with educational computing user groups in your area

From the lists of software prepare a description of each program that can be used to clearly identify the software. Information you should include in the description is given on the SOFTWARE EVALUATION FORM, shown in Appendix C. The detailed description of each software item will be useful when you want to actually obtain and preview the software to determine its appropriateness for the instructional objectives you have established.

Second Step: Evaluation

Most likely you will be able to find formal evaluations of many programs in evaluation resources compiled by organizations formed specifically to assist educators in the software selection process. One especially useful resource is the publication Software Reviews for Adult Education published by the Merrimack Education Center through a joint project with the Massachusetts Department of Education (see Resources). This is a collection of summaries of evaluations on more than one hundred software items appropriate for adult learners. For other programs you may have to run the software to determine how useful it really is. Our rule of thumb in purchasing software is, whenever possible, "Try it before you buy it!"

Over the years the number of criteria and software evaluation forms has multiplied as rapidly as the interest of educators in computer-assisted learning. Typically, evaluation criteria can be grouped into three categories: content, instructional design, and technical design. We have developed a composite of evaluation criteria employed by several organizations engaged in software evaluation. Particular attention was given to software design characteristics related to adult learner needs.

A. Content Characteristics

- Content is error-free and factually correct
- Presentation is logical and well-organized
- Vocabulary, concepts, and examples are relevant to adults
- Difficulty level may be adjusted.
- Content may be changed or added by an instructor.
- Content avoids ethnic, racial, or sexual discrimination and stereotyping.

B. Instructional Design Characteristics

- Learning objectives are clear and worthwhile for adult learners.
- Tone of address is acceptable to adults.
- Feedback is appropriate, useful, and timely.
- Format is challenging, not frustrating.
- Typical runtime is commensurate with educational value.

C. Technical Characteristics

- Documentation is concise, readable, and adequate.
- Program may be entered and exited with ease.
- Screen directions are concise, readable and adequate.

- Adult learners can operate the programs independently.
- Rate and sequence of program operation can be controlled.
- Program is user friendly and apparently error free.
- Screens and/or text is readable and uncluttered.
- Sound and graphics enhance the program; are not demeaning.
- Management/record-keeping is available; use is optional/ required.

In addition to judgements about the actual quality of the software, you need to make judgements about the appropriateness of the programs for the particular instructional application, regardless of its technical qualities. For these purposes, we have a set of questions called Applications Criteria.

- Is the software targeted toward a high priority program need?
- Is the content presented in a way that is compatible with other instructional materials to be used?
- Are the objectives of the program more effectively addressed using traditional instructional materials?
- Are a variety of instructional groupings (i.e. individual, small group, large group) accommodated by the program?
- Can the instructor carry out the role that is required by the program?

It is unlikely that most software presently available today will be able to meet all or most of the criteria listed. You will have to make judgments on whether the inadequacies of a software package can be overcome through other means. With some applications for which little or no appropriate software seems to exist, the experiences of other instructors using lesson authoring tools may provide some insights on viable alternatives to commercially prepared programs. The following incident actually occurred.

After four days of training in designing instructional computer applications and evaluating software for adult learners, Jerry announced that he saw virtually nothing that he could use for his students who had very little or no reading ability. Very simply, one had to read in order to operate even the most fundamental software. The few programs having some promise for use in teaching letter recognition and sight vocabulary included childish graphics and sound reinforcement that were totally inappropriate for grownups.

On the fifth and final days of the computer training sessions, the group leader introduced the participatns to some simple lesson authoring system software. By means of authoring systems, instructors without any programming skills are able to design computer-based lessons involving their own content. At the conclusion of the day all the participating adult educators were allowed to take the authoring software back to their centers for a trial period.

A few months later the trainer who had worked with the group that week attended an adult education conference to conduct a software evaluation workshop. To his surprise, Jerry was at a presentors' booth with one of his ESL students, demonstrating some lessons developed with the authoring system. Upon inspection, the lessons appeared to be a well-devised set of computer-based reading activities. The instructor indicated that he had observed success in using them with his low-level readers. The attending student confirmed that she had greatly expanded her sight vocabulary utilizing the simple, yet motivational lessons.

Third Step: Setting Priorities

With limited time and resources, you will not be able to develop and implement all of the applications which the planning group includes in its expanding vision of instructional computing. It will be necessary to focus your efforts on a subset of the possible applications. To determine the initial focus of the planning group's efforts, the group needs to set priorities based on broad criteria related to overall program development.

Program Needs -- How critical is the application to the overall success of the instructional program? How will learners and instructors benefit from each specific application?

Appropriate Software -- Are available programs really capable of supporting the application(s)?

To this point we have stressed the need to address only these two significant criteria: program need and available software. In the next stage of the planning process, you will explore more fully other aspects of the applications which you give a high priority rating. Before you can make a final decision, you will have to consider other criteria related to hardware, staff training and implementation.

Appropriate Hardware -- What available hardware configurations can support the applications(s)?

Staff Readiness and Commitment -- Are instructors ready to implement the application(s)? Do some applications require more training than others? How do we acquire needed skills to implement the application?

Implementation -- Can the application be implemented in a reasonable amount of time?

Cost -- Is the expected overall cost of the application within the limits of the budget?

As we start the next stage of the planning process, we present these criteria for your consideration. We encourage your planning group to identify others that are important for your own situation.

CHAPTER III: HARDWARE CONSIDERATIONS

Computer systems come in a wide variety of configurations, and costs vary accordingly. In this guidebook our approach is to consider the purchase of a computer system as a whole package. The most important criteria in the selection of the computer hardware is that the system you choose be able to support your applications. Since most applications you will implement require the purchase of software, your software selections will determine hardware specifications. Once you have clearly defined some potential applications and selected the necessary software, you can begin to compare alternative system configurations. At the conclusion of this phase of the planning process, you should be able to develop detailed hardware specifications. Remember, the final decision between competing computer systems should result from a cumulative rating of available software and hardware that can effectively address your educational needs.

Explore System Features

Here is an overview of some specific features of computer systems that you should consider in the hardware selection process:

CPU

In selecting the Central Processing Unit of any computer system, there are two major considerations that will affect your immediate as well as long-range decisions:

- Chips and DOS -- The type of microprocessor chip can make a difference in your decision. Chips on which "standard" operating systems are based provide more flexibility and future software compatibility. Most software for instructional applications is written for the Apple II, or Apple compatible, computer. To run this software you need a system that uses an 8-bit microprocessor that is equivalent to the 6502 or 65C02 chip used in the Apple. Software that is written for the Apple (or compatibles) uses Apple DOS 3.3 or PRO-DOS operating system.

Some instructional software and most tool or administrative programs are available for IBM and IBM compatible computers. These systems are based on a 16-bit microprocessor, such as the 8086 and 8088, or equivalents. Software written for these systems usually requires a version of MS-DOS, or PC-DOS operating system.

Some specialized instructional and administrative software is available to run only on "supermicros" or minicomputers that have 32-bit chips. The UNIX operating system is becoming a popular standard for such systems.

While it is important to realize that the choice of 8, 16, or 32-bit processor determines the speed of processing and in some systems sets limits on the size of the programs, software compatibility is the major factor in chip and DOS selection.

- RAM Memory -- The maximum amount of internal storage, in the form of RAM, or Random Access Memory, determines the size and level of sophistication of the software that a system can handle. Typically, instructional applications on 8-bit micro systems require a minimum of 48Kb (Kilobytes, or thousands of bytes) of RAM, but sometimes as much as 128kb. Many programs for 16-bit systems require only 128Kb memory, but tool applications, such as word processing, often require 256Kb, or as much as 512 Kb memory.

  You should determine memory requirements based upon software selected. Most software products clearly indicate the amount of memory required for operation.

Disk Drives

The type, number and capacity of disk drives in a computer system determine the ease and speed of access to softwre. Most disk drives allow for the storage of 140Kb to 720Kb of information on a standard 5 1/4" "floppy" diskette. The "floppy" diskette is a fragile storage medium which on some popular systems has been replaced by less fragile and larger capacity 3 1/2" "stiffy" micro-diskettes. The 3 1/2" micro-diskettes require a special, more reliable and faster, 3 1/2" disk drive. The software you select may or may not be available on both storage mediums. You may have to choose one type of disk drive. On some systems one of each type of disk drive may be connected to ensure the greatest ease of operation and largest choice of software.

Another option for disk drives is a hard disk drive, which because of its design is usually called a Winchester drive. A hard disk permits large amounts of storage; for example, 20Mb (Megabytes, millions of characters), or more, in one central software library. You need a diskette drive along with the hard disk to be able to load programs and data from diskettes onto the hard disk. While hard disk drives are faster and more convenient than diskettes, not all software is available in versions which can be operated on a hard disk. Many microcomputers (up to 128 systems) may share the same hard disk by means of networking devices. Hard disk drives are usually standard storage devices on large multi-user minicomputer systems.

Monitor

The many choices of display devices deserve consideration during the hardware selection process. The type of monitor you choose is best determined by matching your choice to the applications programs you will run on the system.

For many standard applications (word processing, business software or programming), a monochrome display, white, green, or amber on black background with 80-column display width is required.

When color is important in instructional applications, color monitors are the best choice, but are more expensive than monochrome. At this writing, color monitors range in price from $200 for a composite color to $900 for a high quality RGB (Red, Green, Blue) display unit. The clarity of composite color display is usually inferior to monochrome display, particularly in word processing, administrative, or highly text-oriented instructional programs.

Depending upon your applications, you may have to choose different types of monitors for different systems.

Printers

Dot Matrix printers form characters out of a series of dots impacted on the page by a moving printhead. The more dots in the dot matrix of the print head, the finer the quality of the print. Some dot matrix printers are capable of producing near-letter quality (typewriter-like) printing.

Daisy Wheel printers produce fully formed characters by means of a hammer-like mechanism striking a circular series of spokes with a character at each end of the spoke. Daisy wheel printers produce letter-quality printing.

Laser printers produce characters approximately three times finer than the best dot matrix printers, using laser beam and electrophotography. Extremely high quality text and graphics can be produced with a great variety of fonts and print sizes.

Dual purpose dot matrix printers are the most practical choice for a variety of applications you might anticipate. Capable of producing draft-quality test and graphics, these printers can also produce near-letter quality print in word processed correspondence. They are faster, more versatile, and less expensive than daisywheel printers. Currently, the high price of laser printers makes the extraordinary qualities of laser technology prohibitive for most educational applications.

Keyboards

You should be aware of two keyboard considerations which may affect your hardware decisions:

- Editing Keys -- The existence of and number of editing keys should be considered where software applications involve working with data on the screen. Editing features vary

widely, ranging from none on some popular systems, to fullcursor control (all four directions), multiple programmable function keys, and special screen editing keys such as insert, delete, etc. required for word processing.

- Numeric Keypad -- May be important where numbers will be in constant use (financial applications or math drill and practice). On most systems the calculator format is part of the main keyboard, but on others it is an extra-cost add-on.

Hardware Selection Process

First Step: Perform Needs Assessment

You need to determine the specific computer capabilities required for each intended application. For most applications there may be only two or three choices of computer systems which will support the software you select. To define your hardware needs, start by answering the following questions for each application:

- What software is required? Actually list the programs. For each program in the collection determine the computer capabilities required.
    a. RAM Memory? 64K? 128K? 256K?
    b. Type and number of disk drives? Is a hard disk version available?
    c. Type of display? Monochrome or color?
    d. Printer required?
    e. Special keyboard features? Numeric keypad? Mouse? Other special devices needed for input?
- Who is going to use the system(s)? The more precisely you can define the application the more accurately you can estimate equipment needs.
    a. How many learners will use the system? Can they work together in teams of two or three to a machine?
    b. How much time do learners need to accomplish the intended objectives?

- Where and when will the computer(s) be available? Think about the physical locations of equipment.

    a. Will equipment be centrally located in a lab?

    b. When will students have access to the computers?

    c. How will sessions on the systems be supervised?

Second Step: Fine Tune Configurations

Depending upon the applications you choose to implement and the software required, your hardware options will fall into one or a combination of the following configurations.

- Stand-alone MICRO system(s)
- Networked MICRO systems
- Multi-user SUPERMICRO/MINI system

Each configuration has inherent advantages and disadvantages that you should consider before making a final choice.

A. Stand-Alone MICRO Systems(s)

For most applications which require at most three or four learning stations, stand-alone microcomputers (CPU, monitor, disk drives, etc.) are the most logical hardware choice. For instructional applications Apple IIe systems are popular because most software that meets the needs of adult learners is only available to run on Apple systems. Particularly, for small learning centers starting with limited budget a practical way to begin is to select the configuration given below:

- Apple IIe, with 80-column display card and expanded 128K memory
  dual 5 1/4" "floppy" disk drives
  Monochrome monitor
  Dot matrix printer with necessary cables and connectors

Additional systems might consist of:

- Apple IIe, with 80-column display card and expanded 128K memory
  single 5 1/4" disk drive
  Monochrome or color monitor

B. Networked MICRO Systems

In large centers where applications require six or more learning stations, many microcomputers may be connected by means of a networking device to a shared central software library stored on a hard disk. Networking permits individual microcomputers to work as stand-alone units or to share the hard disk. Networked systems eliminate the need for users to handle software stored on fragile diskettes and can reduce overall software costs. Two major considerations in selecting networked configurations are: (1) availability of appropriate software in network versions; and, (2) the need to locate equipment in close proximity to share the networker/hard disk drive.

C. Multi-User SUPERMICRO/MINI Systems

As we mentioned in Chapter II, several vendors offer courseware designed to operate on networked MICRO or on large multi-user SUPERMICRO/MINI systems. If software available from these vendors uniquely meets your program needs, you should give careful consideration to all advantages and disadvantages of these integrated software/hardware systems. The major advantages of both types of systems are that users have convenient access to large amounts of courseware and that they allow instructors to utilize powerful, instructional management systems. The major disadvantages are their comparatively higher cost and, with some systems, restrictions on software compatibility. (For more information on Integrated Systems see Electronic Learning, Feb. 1986, "Buying a Hardware/Software System".)

The information below may be helpful to organize important considerations related to each of the three popular hardware configurations.

Stand-Alone MICROS

Advantages

- low cost
- portability
- flexible configurations
- different systems selected for different applications

Disadvantages

- require multiple copies of software
- cumbersome for record-keeping

Considerations

- cost: for low-budget situations, buy one system, then add more
- ease of use: depends upon software you choose
- software: wide range of programs available
- training required: usually not included with purchase; varies with software chosen

Networked MICROS

Advantages

- equipment already in place may be added to network
- provides easy access to central software library
- cost savings in software acquisition
- ease of student use
- record-keeping/management systems
- permits peripheral sharing
- micros may be used as stand-alones

Disadvantages

- technical expertise required for use
- not all software is available

Considerations

- cost: cost-effective with multiple station labs
- ease of use: minimizes disk handling by learners
- software: not all programs available in network versions
- training: more required for management/recordkeeping systems

Multi-User SUPERMICRO/MINI Systems

Advantages

- management systems collect and anaylze data for CBAE applications
- software usually extensive, and sophisticated in design
- may have stand-alone micros as terminals

Disadvantages

- locked into a system
- annual fee for software license
- operation depends on host computer, all work or none work
- terminals must be located near host
- fewest options for software

Considerations

cost: minimum of 6 stations to be practical

ease of use: minimum teacher intervention required

software: extensive library stored in central library

training: usually provided with system, essential for use of management system

Third Step: Acquire Hardware

Once you have determined the best configuration(s) of computer hardware that will support your applications, it will be necessary to translate the results into procurement specifications. If you are sending out a request for bids in order to feel out the market and to ascertain which kind of equipment is available, general specifications are usually adequate. However, after you have done a detailed needs assessment and you are in the position of actually committing to the purchase of a computer system, it is best to have tight specifications.

If you are able to select items from an approved bid list, thus avoiding the need to send out a request for bids, detailed specifications will be helpful to determine exact models and their equivalents. If you are required to write a complete request for bids, you might seek assistance from a local purchasing agent, regional service center, or state purchasing office. In addition to detailed and accurate descriptions of each major component of the computer system, specifications should also include the following items:

- requests for warranty
- shipping and insurance
- request for delivery time after receipt of order
- installation
- maintenance
- training and support

Hardware selection involves complex decision-making which is complicated by new developments in this rapidly changing technology. When you have fine-tuned the final hardware configurations for each application, you should be able to estimate hardware costs. Projecting other related costs may be more difficult. The following percentage estimates may be helpful:

Item	% of Budget
Software	20%
Hardware	70%
Maintenance	5%
Miscellaneous Supplies	5%

From initial assessment to final installation, with proper consideration of your needs and background information, you can make the purchase of computer hardware a manageable and safe task. Using methodical steps and following guidelines provided here, you should be able to eliminate many of your worst fears and set a path towards a viable decision on instructional computer applications.

CHAPTER IV: PLANNING FOR IMPLEMENTATION

Before you make a commitment to undertake a significant program initiative, you should consider the real costs of implementation, in terms of time, money, and organizational impact. In deciding which computer applications you can implement, the training needs of the instructional staff are a major factor. Having selected software and hardware, however, you should find it to be relatively easy to estimate staff development requirements. This chapter gives you some general guidelines.

After you have made the commitment to specific applications, you will have to design activities which will permit staff to develop the skills and knowledge necessary to implement the applications in their instructional programs. You will also have to design systems for the overall management of the resources required by the staff, especially during the early stages of implementation. We suggest a four-step approach to planning for implementation:

1. estimate staff training requirements
2. design a staff development program
3. organize an application support system
4. design a system for monitoring/evaluation

Estimate Staff Training Requirements

It is important to distinguish between staff awareness activities conducted as part of the preliminary planning activities and actual staff development. The awareness, or orientation sessions, were conducted to allow staff to develop a basic level of computer awareness needed to participate in the various phases of the planning process. Now you need to consider a second phase of staff training which focuses on preparing staff to deliver instruction utilizing specific hardware and software.

Staff training requirements are related to both the hardware and the software involved in the application. Accurate training estimates are important because the amount and cost of training and other staff development activities are often grossly underestimated, particularly for developing skills beyond basic hardware and software competencies. The following considerations may be helpful in preparing staff development cost estimates.

- For each set of related computer applications, develop staff training requirements that will enable teachers to fulfill their role in the learning process.
- The basic steps to projecting training costs are:
    1. For each program initiative, determine the number of instructors who will implement the application.
    2. Determine the per unit cost of obtaining training required and multiply it by the number of staff to be trained.
    3. Add cost estimates for other expenditures that apply: costs of training materials, facilities, staff stipends, substitute teachers, etc.
- Using percentages of the total computer applications budget as estimates of training costs is likely to result in inaccuracies, unless they are based on experience.
- Some staff members are likely to already have some of the required skills and knowledge. Identify who they are. Do not put staff through training they don't need.
- There are at least five popular ways to procure staff development services, each with its own costs:
    1. Hardware/Software Vendor -- This training is usually machine specific, often technical, dealing with system operation. Per participant costs may be as high as $250/day.
    2. Technical Service Center -- A self-contained facility with hardware, software, and trainers, typically located in an intermediate service agency. Fees are usually $60 to $100 per participant/day.
    3. Technical Service Center/On-Site -- The services of the center may be brought on your site, using local facilities and equipment. Fees are generally lower than those mentioned above.

4. Individual Consultants -- Consultants may provide services using local facilities and equipment. Typical fees range from $150 to $500 per day.

5. Colleges -- Formal college courses for which a participant fee is charged, may vary considerably for various institutions.

- Considerable cost savings may be achieved by developing your own training capacity. Train-the-trainer courses are offered by some organizations with varying costs.

Design Staff Development Activities

Only after making a commitment to the implementation of a specific application should you undertake the detailed design of staff development activities. Having identified required staff competencies, you should organize them into groups that can be covered within conveniently scheduled training sessions. The outline below illustrates how specific competencies may be organized by broad competency levels.

Level I: Basic Awareness

1. Can operate a computer

   - knows the function of components of micro system
   - can use the keyboard
   - can use peripherals (disk drive, printer, etc.) as needed

2. Can operate prepared software

   - can enter and exit programs
   - can respond to menus and program control prompts

Level II: Instructional Awareness

3. Understands specific computer at system manager level

   - knows major functions of operating system
   - can perform disk/file management tasks

4. Can choose software

   - knows sources of software information
   - can apply software selection/evaluation criteria

5. Can apply computers in instruction

   - can match software to applications
   - can structure instructional sessions for learners
   - can judge relative effectiveness and appropriateness of software

For most staff members, initial training should attempt to take them through the Instructional Awareness level and provide them with hands-on experience with the hardware and software they will be using. Objectives for a typical three-day training program at Merrimack Education Center are given in Exhibit 1.

COMPUTER LITERACY FOR EDUCATORS

Overview: This introductory course is conducted in twelve sessions over three days. It provides an overview of basic information about computers, courseware, and classroom applications, and provides training in using computers for teaching and management. The course is intended for teachers and administrators who have little or no previous knowledge or experience with computers.

Objectives: At the completion of the course, participants will be able to:

1. Identify the distinguishing features of the most popular microcomputers.
2. Select computer hardware (micro and mini) appropriate for particular courseware and classroom applications.
3. Perform basic system operations on at least two computers.
4. Develop and use criteria for the selection and evaluation of courseware.
5. Develop specific applications of computers for use with students.
6. Design strategies for the implementation of computer-assisted learning.

Exhibit 1

An outline for each two-hour session within each day is offered in Exhibit 2.

OUTLINE OF SESSIONS

Schedule	Topic	Activities
First Day		
Session 1.1	Introduction Initial computer experiences	Hands-on experience with micro and mini-computer
Session 1.2	Computer competencies: history and training	Lecture and discussion
Session 1.3	Classifying CAL software	Demonstration and hands-on experience
Second Day		
Session 2.1	Hardware systems	Demonstration
Session 2.2	Software review	Examination of selected commercial courseware
Session 2.3	Classroom applications	Panel & group discussions of successful practices
Third Day		
Session 3.1	Classroom applications	Design of instructional applications by small groups
Session 3.2	Implementation strategies	Group work on strategies

Exhibit 2

Exhibit 3 shows in detail what a given training day, in this case the first day, might contain.

SAMPLE TRAINING DAY OUTLINE

Specific Components (knowledge, skills, attitudes)

1. to understand how to use the Apple IIe with educational applications
2. to understand how a microcomputer works as a machine so that the user can operate it without assistance
3. to become comfortable in using a microcomputer in a classroom situation and in talking to others about how it can be used in instruction

Topics

How a Microcomputer Does Its Work	-- Lecture & Demonstration
Running Programs	-- Hands-On
Care & Handling of Diskettes	-- Lecture & Demonstration
Review of Available Software	-- Hands-On & Discussion

Related Activities (demonstration, lecture, hands-on, materials development, discussion, simulation etc.)

Hands-on activity with computers

Equipment

Apple IIe's with single drives and color monitors with necessary extension cords and power strips

Overhead projector

Materials

-- Minnesota MECC training materials: Introduction to the Apple II in Instruction
-- MECC Apple II User Guide
-- Handouts
-- Transparencies
-- MECC Apple Demonstration Disk (with documentation)
-- Selected Commerical Software

Feedback/Evaluation

Standard Merrimack Training Evaluation Form

Exhibit 3

While training sessions are likely to be the most efficient means of providing staff with new knowledge and skills, you should consider a variety of strategies and activities as they best meet your own needs. Some alternatives that other adult educators have found to work well are:

- self-study modules
- teaming inexperienced staff with more experienced colleagues
- individual or small group work sessions for developing instructional materials and implementation strategies
- observation of exemplary computer applications at other adult education programs

Studies of the implementation of new programs and practices attest to the importance of comprehensive and effective staff development. The following guidelines (adapted from Getting Started, New York State Education Department) may be helpful in planning your activities.

1. Aside from its intrinsic benefits, a commitment to staff development will communicate to staff members that the computer applications are a high program priority.
2. Involve program administrators in staff development activities. Research and experience testify to the importance of their involvement and leadership in major educational changes.
3. The following principles have been found to enhance computer competency training:
    - Training should prepare the staff to perform the task and also provide criteria for determining their degree of success.
    - Training activities should be in a sequence that gradually increases in complexity.
    - Training should be sufficiently flexible to allow trainees to begin at their own level of ability and to progress at their own rate.
    - Training should take place during the work day and make use of actual situations involving students.

- The training should be adjusted to the instructional setting that exists.
- Incentives should be provided which motivate the staff to actively participate.
- Whenever possible, staff members within the organization of the district or school should be used as instructors in the training.
- Instructors should have an opportunity to practice new skills in the course of their regular teaching.
- Skills acquired in a training program will tend to go unused if not shown to be valued by the administratrors of the program.
- Staff involved in a training program should have a continuous access to an available facilitator--a trained technical resource.
- Expect skepticism and resistance from some staff members (it's natural) and make provisions for dealing with it openly and directly.

Organize an Application Support System

Up to this point the planning group has served as the principal means of coordinating computer applications program development. A group is not the most efficient means of coordinating implementation. Ideally, one individual should be designated as the coordinator, responsible for overall program management. In centers where it is difficult to allocate a full-time person to this role, one administrator or instructor mignt be given the role as part-time responsibility.

The principal responsibility of the program coordinator is managing the implemenation of the applications developed by the planning group. Putting all of the elements of the application into operation will require detailed specification of activities and their sequencing. Special attention needs to be given to many factors which research and experience have shown to be critical to successful change efforts in educational settings. Consider these guidelines when putting your plans into effect.

- Keep staff members informed of program implementation activities.

- Encourage and support your program director in the role of facilitator and as a resource person to staff members.

- Schedule meetings where staff can discuss implementation difficulties with their colleagues and share ideas for dealing with them. Use these sessions to make sure that everyone has a clear understanding of the program.

- Provide instructors with sufficient time to prepare or adapt instructional materials for their own use. They will need time to work with courseware on the computer.

Experience with computers and software in schools indicates that they are highly susceptible to damage and theft when there is no system for maintenance and security. Particulary in centers with large numbers of computers, there is a need for a system for scheduling access to hardware and for the distribution and storage of software. Consider these suggestions for designing your own support system.

- Most hardware problems can be traced to mistreatment of the equipment. When computers are not in use, keep them protected from dirt with dust covers. Secure software in covered cases.

- Computers require periodic maintenance. Make sure you budget for maintenance and repair contracts, or set aside an amount for emergency repairs.

- Locate equipment in an area that can be secured. Your budget might include amounts for installing a security system.

- Allow for plenty of workspace around systems for learners to place other support materials.

- Inventory your hardware and software. Particulary as your software collection grows, an up-to-date list of software and its location will facilitate efficient distribution of each program.

Design a System for Monitoring and Evaluation

There are essentially two types of evaluation information that you may want to collect in order to "fine-tune" your computer applications and make judgments on their effectiveness. First, implementation needs to be monitored to determine if it is proceeding as planned. This can be accomplished by using checklists, observations and discussions with teachers. Checklists are useful to insure that instructors are clear about what specific activities are required to implement an application. A checklist may also serve as a self-administered instrument to enable instructors to identify implementation problems that need to be addressed.

Second, implementation needs to be monitored to determine the impact of the application on the learners. Can students operate the computers? Are their skills improving as a result of using the computer? What do learners like and dislike about the new situation? Most of these learner performance questions will need to be addressed by customized tests and other instruments, because commercial instruments are not widely available. Consider these two suggestions.

- Pay attention to what is actually happening in learning situations. Insure that actual implementation is going according to plans. If not, find out why.
- Document implementation activities. What problems were encountered? How were they solved?

Looking Ahead

We have completed the planning cycle. At this point you will want to review the major steps to be taken before you begin your formal planning efforts. Let us offer this note of caution. Even as you begin planning, the ground will be shifting beneath your feet. New hardware and software will be available; new program ideas will surface in your readings and from your staff. In short, the information you will be basing your decisions on will be changing.

Because computer technology and our knowledge of it is changing so rapdily, some of the aspects of your plans will likely become obsolete faster than the computer hardware it addresses. This is no reflection on the quality of your efforts, but on the nature of planning in a rapidly changing environment. It is not merely or even primarily because of the advances in equipment that your plans will require refinement and restructuring; it is because of the rapid growth in your development as implementers of technology in education. To that end we hope that the guidebook is useful.

APPENDIX A

RESOURCES

Computer Applications Planning. Merrimack Education Center, 101 Mill Road, Chelmsford, Massachusetts, 01824.

Computer Assisted Instruction in Adult Education: A Guide for Teachers and Administrators. Office of Continuing Education, Newport School Department, Newport, Rhode Island, 02840.

The Digest of Software Reviews: Education. 1341 Bulldog Lane, Suite C, Fresno, California, 93710.

EPIE PRO/FILE and Evaluation. Educational Products Information Exchange Institute (EPIE), Box 620, Story Brook, New York, 11790.

Evaluation of Educational Software: A Guide to Guides. The Southwest Educational Development Laboratory, 211 East 7th Street, Austin, Texas, 78701.

Software Buyer's Guide for Adult Education. Region X Adult Education Software Consortium, Treaty Oak Community College Service District, 400 East 4th, The Dalles, Oregon, 97058.

Software Reviews for Adult Education. Merrimack Education Center 101 Mill Road, Chelmsford, Massachusetts, 01824.

APPENDIX B

SOFTWARE IDENTIFIED BY ADULT EDUCATORS
AS BEING USEFUL WITH ADULT LEARNERS

Title	Publisher	Area of Application
COMPUTER LITERACY		
Computer Concepts	Continuous Learning	computer literacy
ESL		
Essential Idioms	Regents ALA	idioms
Grammar Mastery	Regents ALA	language arts
Spell It!	Davidson	tool for teaching spelling
Word Alert	Regents ALA	vocabulary
LANGUAGE ARTS		
Analogies	Hartley	analogies
Basic English Skills	Britannica	grammar, sentence structure
Bank Street Writer	Scholastic	word processing, composition
Capitalization	Hartley	capitalization, writing skills
Cloze Plus	Milliken	language, reading
Comprehension Power	Milliken	reading comprehension
Context Clues	Educational Activities	reading
Core Reading	Educational Activities	reading
Fact or Opinion	Hartley	reading
Gapper	HRM	reading, context clues, vocabulary
Grammar Mastery	Regents	grammar
Master Spell	MECC	spelling utility
Missing Links	Sunburst	reading, context clues, vocabulary, spelling
Missing Links/ English Editor	Sunburst	shell version of Missing Links
Punctuation Skills	Milton Bradley	instruction, practice, mastery of punctuation skills
Reading & Thinking	Queue	reading, basic skill remediation
Sentence Combining	Milliken	writing
Spelling Vol. 1 & 2	MECC	drill & practice, immediate reinforcement
Story Tree	Scholastic	writing tool
Word Attack	Davidson	vocabulary
Word Quest	Sunburst	alphabetization
Writing Wizard	Scarborough	word processor, writing skills

LIFE SKILLS

Daily Living Skills	Britannica	part of a series Banking & Credit addressing subject of coping
Plato Life Coping Skills	Control Data	human relations

MATH

Arithmetic Classroom	Sterling Swift	division & multiplication
Elementary Math, Vol. 3	MECC	geometry
Basic Math Competency	Educational Activities	basic math skills
Fractions	Q.E.D.	concepts & operations with fractions
Lemonade	MECC	simple economics, estimation
Money! Money!	Hartley	recognition & use of cash
Math Sequences	Milliken	arithmetic, fractions
Semcalc	Sunburst	basic skills, problem solving
The Pond	Sunburst	sequences, patterns, logic
Teasers by Tobbs	Sunburst	basic operations, multi-step problems
The Factory	Sunburst	problem solving

SCIENCE

Systems of the Human Body	Little Shaver Educational Software	biology

SOCIAL STUDIES

President Elect	Strategic Simulations	simulates presidential election

TOOLS

Crossword Magic	Mindscape	create customized crossword puzzles
Lesson Create	Hartley	utility for writing lessons, drill sequences, tests or tutorials
Math Sheet	Houghton-Mifflin	worksheet generator
Teacher Utilities, Vol. I	MECC	test generator

APPENDIX C

MASSACHUSETTS ADULT SOFTWARE SPECIALISTS

SOFTWARE EVALUATION FORM

MATERIALS APPROPRIATE FOR ADULT LEARNERS

PROGRAM TITLE:_____ Software Producer:_____ Version:____

Hardware Requirements:_____

Cost, if known:_____ Includes Back-Up Disk:_____

Comment on Typical Runtime:_____

INSTRUCTIONAL PURPOSES AND TECHNIQUES (check all that apply)

Appropriate Uses:

___ABE (Ø-4); ___Pre-GED (5-8); ___GED(9-12); ____ESL; ___Pre-Voc.

Specific Subject/Skill Area_____

___Basic Skill Remediation
___Skill/Knowledge Development
___Enrichment
___Learning Tool
___Administrative/Teacher Tool
___Drill and Practice
___Tutorial
___Game or Simulation
___Diagnostic/Prescriptive
Other_____

INSTRUCTIONAL CHARACTERISTICS	Yes	No
Learning objectives are clear and worthwhile for adult learners.	___	___
Typical runtime is commensurate to educational value.	___	___
Tone of address is acceptable to adults.	___	___
Format is challenging, not frustrating.	___	___
Feedback is appropriate, useful, and timely.	___	___

CONTENT CHARACTERISTICS	Yes	No
Content is error-free and factually correct.	___	___
Difficulty level may be adjusted.	___	___
Presentation is logical and well-organized.	___	___
Vocabulary, concepts, and examples are relevant to adults.	___	___
Content can be changed or added by instructor.	___	___
Content avoids ethnic, racial, or sexual discrimination and stereotyping.	___	___

TECHNICAL CHARACTERISTICS	Yes	No
Documentation is concise, readable, and adequate.	___	___
Screen directions are concise, readable, and adequate.	___	___
Adult learners can operate program independently.	___	___
Program may be entered and exited with ease.	___	___
Program is user friendly and apparently error free.	___	___
Screens and/or text is readable and uncluttered.	___	___
Sound and graphics enhance the program; are not demeaning.	___	___
Rate and sequence of program operation can be controlled.	___	___

Management/Record keeping system: ___None; ___Optional;
___Required for program operation

PROGRAM QUALITY SUMMARY

4 (high) to 1 (low)

___Instructional Characteristics

___Content Characteristics

___Technical Characteristics

RECOMMENDATIONS

___I highly recommend this program for use with adult learners.

___I would use this program, but with some reservations or changes.

___I would neither use nor recommend this program for adult learners.

Comments: (Strengths, weaknesses, suggested uses, training requirements, etc.)

_____

_____

_____

_____

Evaluator's Name: _____ Date: _____

Position: _____

Organization: _____

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